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**Economic Commission for Europe**

Inland Transport Committee

**World Forum for Harmonization of Vehicle Regulations**

**175th session**
Geneva, 19-22 June 2018
Item 14.3. of the provisional agenda
**Consideration and vote by AC.3 of draft UN GTRs and/or draft amendments to established UN GTRs, if any: Proposal for Amendment 1 to UN GTR No. 19 (Evaporative Test emission procedures for the Worldwide harmonized Light vehicles Test Procedures (EVAP WLTP))**

# Technical report on the development of Amendment 1 to UN GTR No. 19 (Evaporative Test emission procedures for the Worldwide harmonized Light vehicles Test Procedures (EVAP WLTP))

## Submitted by the expert from the European Commission*

The text reproduced below was prepared by the Informal Working Group (IWG) on Worldwide harmonized Light vehicles Test Procedure (WLTP) and was adopted by the Working Party on Pollution and Energy at its January 2018 session. This is the technical report, based on GRPE-76-06-Rev.1, submitted together with the proposal for Amendment 1 to UN GTR No. 19 on EVAP WLTP (ECE/TRANS/WP.29/2018/73).

* In accordance with the programme of work of the Inland Transport Committee for 2018–2019 (ECE/TRANS/274, para. 123 and ECE/TRANS/2018/21, Cluster 3.1), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

GE.18-05351(E)

*1805351*

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# Technical report on the development of Amendment 1 to UN GTR No. 19 (Evaporative Test emission procedures for the Worldwide harmonized Light vehicles Test Procedures (EVAP WLTP))

## I. Introduction

1. During the seventy-fourth session of the Working Party on Pollution and Energy (GRPE) in January 2017, the Evaporative emission test procedure for the Worldwide harmonised Light vehicles Test Procedures (WLTP EVAP) Task Force (TF) submitted a working document and an informal document for the consideration of GRPE.

2. The working document ECE/TRANS/WP.29/GRPE/2017/3 (Proposal for a new UN Global Technical Regulation on Evaporative emission test procedure for the Worldwide harmonized Light vehicles Test Procedures), UN GTR No. 19, contained the new proposed test procedure to measure evaporative emission from non-sealed fuel tank systems.

3. Non-sealed fuel tank systems are mostly used in conventional vehicles with an internal combustion engine. Since these vehicles have a high chance of purging the fuel vapours inside the fuel tank systems and the canister(s) into the internal combustion engines, the pressure inside the fuel tank generated by fuel vapours is well maintained at low level.

4. From late 2016 to September 2017, thirteen meetings (including three face-to-face meetings and two drafting meetings) were held and the WLTP EVAP task force worked to include a test procedure covering the sealed fuel tank systems in UN GTR No. 19. These systems are expected to be used in the hybrid electric vehicles driven mainly by electric engines and in the future conventional vehicles.

5. Amendment 1 to UN GTR No. 19 complements the text of the UN GTR not only by adding descriptions of the test procedure for sealed fuel tank systems but also by adding other provisions related to non-sealed fuel tank systems which were raised along the discussions on sealed fuel tank systems.

6. The discussions of Amendment 1 were led by experts from Japan (Ms. Mayumi "Sophie" Morimoto) and the European Commission's Joint Research Center (Giorgio Martini). The drafting of the text was led by the expert from the European Commission (Serge Dubuc).

## II. Sealed fuel tank systems - Test procedure development

### A. Objectives

7. During parking events, the fuel temperature in the fuel tank system increases due to rising ambient temperature and solar radiation. As a result of the increased temperature and consequent evaporation of the fuel, as well as expansion of the air/fuel vapour mixture, the pressure inside the fuel tank system increases significantly. This may lead the evaporation of the lightest petroleum fractions with a corresponding increase of the pressure inside the fuel tank system. In non-sealed fuel tank systems, which are mostly used in conventional vehicles, the increase of the pressure inside the system is limited by the high probability of purging vapours inside the fuel tank system, and the pressure is vented mainly to the canister(s). The canister adsorbs and stores hydrocarbons (HC). However, this canister has a limited

adsorbing capacity (depending on several factors of which the most important are the carbon quality, mass, and fuel specification as well as the ambient temperature) and must be periodically purged to desorb the stored hydrocarbons. This occurs during vehicle driving events since part of the combustion air flows through the canister removing the adsorbed hydrocarbons which are then burned inside the engine.

8. Due to the potentially limited operation time of the combustion engine in hybrid electric vehicles, the use of sealed fuel tank systems is one of the alternative solutions to the system described above to control evaporative emissions. A sealed fuel tank system is by design a closed system that can store fuel vapours inside the system up to the fuel tank relief pressure. In this case, no fuel vapour is vented to the canister nor to the atmosphere. However, the sealed fuel tank systems must be depressurised. This depressurisation is generally achieved by opening a pressure relief valve before refuelling to ensure a safe operation. The mixture of air and vapours released through the pressure relief valve are stored in the canister(s) which are then purged when the combustion engine runs.

9. In the case of very hot temperature conditions, the pressure inside the fuel tank system might exceed the fuel tank relief pressure which is designed to avoid the risk of a rupture of the sealed fuel tank system.

10. A technological option to limit the pressure increase inside the sealed fuel tank system due to a rising ambient temperature is insulating the tank itself. This means that the temperature of the fuel will remain lower than the ambient temperature. This option has been taken into account when developing the test procedure.

## B. Approach

11. The following points were discussed during WLTP EVAP task force meetings:

(a) Discussion points related to sealed fuel tank system test procedure

(i) Definitions and abbreviations

(ii) Test sequence – one continuous test or two separate tests (stand-alone puff loss test, and stand-alone hot soak loss and 48-hour diurnal test)

(iii) Fuel tank relief pressure requirement for sealed fuel tank system

(iv) Condition before puff loss loading to canister – soak temperature, soak duration, and pressure inside the fuel tank system after depressurisation

(v) Overflow puff loss emissions check after depressurisation

(vi) Condition of diurnal breathing loss test for sealed fuel tank system

(vii) Soak temperature

(b) Discussion points related to improvement of latest UN GTR No. 19

(i) Vehicle preparation – baking of tyres

(ii) Type approval authority witness

(iii) Butane Working Capacity (BWC) measurement

## C. Amendments introduced in UN GTR No. 19

### 1. Sealed fuel tank system test procedure

*1.1. Definitions and abbreviations*

12. Definitions of "*NOVC-HEV*", "*HEV*" and "*HV*" were added using those from UN GTR No. 15.

13. Definition of "*Monolayer tank*" was updated and the term was renamed to "*Monolayer non-metal tank*".

14. Definition of "*Sealed fuel tank system*" was updated. Whether to include "*Semi-sealed fuel tank system*" which might release the vapours and the pressure from system on first day of diurnal phase but the pressure relief valve would not open for subsequent days was discussed. As not enough data was available, the task force decided to discuss it at the next stage.

15. Definition of "*Evaporative emissions*" was updated to include hydrocarbon vapours lost from the fuel system immediately before refuelling of a sealed fuel tank.

16. Definitions of "*Depressurisation puff loss*", "*Depressurisation puff loss overflow*", "*Fuel tank relief pressure*" and "*Auxiliary canister*" were newly added since these terms are related to sealed fuel tank system test procedure.

17. Definition of "*2 gram breakthrough*" was newly added to improve UN GTR No. 19.

18. The abbreviation for rechargeable electric energy storage system was newly added since this term is related to the sealed fuel tank system test procedure.

19. Some terms in definitions and abbreviations were decapitalised for drafting purpose.

*1.2. Test sequence – one continuous test or two separate tests (stand-alone puff loss test, and stand-alone hot soak loss and 48-hour diurnal test)*

20. The test procedure of sealed fuel tank systems consists of two parts. One is the determination of the volume of the depressurisation puff loss loaded to the canister immediately before refuelling and its overflow from the canister. The other is the stand-alone hot soak loss and 48-hour diurnal test, which are the same as for non-sealed fuel tank system.

21. A 2 gram breakthrough loading of the non-sealed tank system was replaced by the depressurisation puff loss loading volume for subsequent procedures which are the hot soak loss test and the 48-hour diurnal test.

22. Japan proposed to set separate test sequences to improve testing efficiency. On the other hand, some vehicle manufacturers indicated there are some systems which cannot separate canister(s) from system, and this requires a continuous one test sequence. With consideration of those systems, the task force decided to have both one continuous test procedure and two separate tests.

*1.3. Fuel tank relief pressure requirement for sealed fuel tank system*

23. JRC proposed to set a minimum requirement for fuel tank relief pressure. This proposal was based on concerns for vehicles which would pass the type approval test but might emit significant amount of vapours when the temperature rises above 35°C in the market. Some vehicle manufacturers and Japan opposed this proposal since this proposal may eliminate the possibility of new technologies such as insulated fuel tank systems. To solve the concerns of both, the task force determined to have 2 conditions for the temperature profile during the 48-hour diurnal test, one for systems with a fuel tank relief pressure equal

to or higher than 30kPa and another for those below 30kPa. This would provide manufacturers with the scope to develop systems which incorporate a wider range of new technologies.

24. The value of the fuel tank relief pressure to determine the condition of preparation was decided based on the study result provided by task force members. Their study was based on maximum monthly temperature of Rome, New Delhi and Kyoto. The study also included the estimation of the fuel tank pressure based on market fuel properties under the temperature condition of those cities. The task force decided to set 30kPa as a threshold by considering +5°C margin from maximum temperature.

*1.4. Condition before puff loss loading to canister –soak temperature, soak duration, and pressure inside the fuel tank system after depressurisation*

25. The soak temperature profile before puff loss loading to the canister was decided based on the 24-hour diurnal breathing loss test (DBL). After 11 hours, the temperature inside the soak room will reach to the maximum during the DBL profile. Therefore, the task force decided to use 11 hours as soak duration.

26. The pressure inside the system after depressurisation was decided as maximum 2.5 kPa above ambient pressure in normal vehicle operation and use. This is based on the pressure requirement inside the fuel tank system during run loss test as defined by the United States Environmental Protection Agency.

*1.5. Overflow puff loss emissions check after depressurisation*

27. Immediately before refuelling, the sealed fuel tank system will be depressurised before the fuel cap is opened. When depressurised, the pressure will be relieved to atmosphere through the canister. To avoid unexpected escape of vapours with those pressures, Japan proposed to include a check of overflow vapours from the canister during the sealed fuel tank system test procedure. After extensive discussions, the task force supported the proposal.

*1.6. Condition of diurnal breathing loss test for sealed fuel tank system*

28. As explained in paragraph 1.3., the task force decided to have two conditions for the temperature profile during the 48-hour diurnal test depending on the fuel tank relief pressure. The systems with fuel tank relief pressure equal to or higher than 30kPa will use a 20 to 35°C temperature profile, the same as a non-sealed fuel tank system. On the other hand, the system with a pressure lower than 30kPa should have a 20 to 38°C profile. This profiie was decided based on estimated pressure of sealed fuel tank system at +5°C margin maximum temperature.

*1.7. Soak temperature*

29. Within UN GTR No. 19 there are two different types of soak which are undertaken at different temperatures. The soak which occurs before the dynamometer test should be carried at 23°C, because dynamometer test is also undertaken at 23°C. The soak that takes place prior to the following sequences are carried out at 20°C because these sequences start from 20°C.

(a) The diurnal test (for both non-sealed fuel tank system and sealed fuel tank system test procedures);

(b) The conditioning for puff loss loading (for sealed fuel tank system test procedure only);

(c) Fuel tank depressurisation (for sealed fuel tank system test procedure only).

30. However, there exists one exemption in the sealed fuel tank system test procedure. This is where the dynamometer test starts after soaking at 20°C (paragraph 6.6.1.12. followed by paragraph 6.5.6. of Annex 1 of Amendment 1 to UN GTR No. 19). After intensive discussion within TF members, they decided to skip another soak at 23°C because it would cause a burden to soak again for at least another 6 hours.

## 2. Discussion points related to improvement of latest GTR No. 19

### *2.1. Vehicle preparation – baking of tyres*

31. During seventy-fourth session of GRPE, The European Tyre & Rubber Manufacturers' Association (ETRMA) proposed to clarify the baking temperature of tyres. Task force members studied many documents to set the appropriate temperature. Finally, the temperature of baking tyres was decided based on the description of "bake" in US Tier 3 preamble, which was 50 °C or higher.

### *2.2. Type approval authority witness*

32. During seventy-fourth session of GRPE, the International Motor Vehicle Inspection Committee (CITA) pointed out that the description in paragraph 5.3.11. of Annex 1 of UN GTR No. 19 "The manufacturer shall provide the responsible authority a test report" might be misleading and could be interpreted to mean that there is no chance of witness of evaporative emission test. Also at nineteenth session of the Informal Working Group (IWG) on WLTP, Union Technique de l'Automobile, du motocycle et du Cycle (UTAC) pointed out the need for a clearer description of an audit or a witness test.

33. With much discussion between authorities and industry members, paragraph 5.3.11. of Annex 1 of UN GTR No. 19 (paragraph 8. of Annex 1 of Amendment 1 to UN GTR No. 19) was changed to delete the description pointed out by CITA. The description of an audit or a witness test raised by UTAC was decided not to be written in detail since how this should be done depends on each Contracting Party.

### *2.3. BWC measurement*

34. Japan raised the concern that a result from measurement of BWC50 will never be used or submitted to an authority. After discussion within task force members, measurement of BWC50 was deleted from the test procedure. However, BWC300 measurement, which is used to decide evaporative emission family, remains and shall be done before certification test according to the procedure written in Amendment 1 to UN GTR No. 19.

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## Economic Commission for Europe

Inland Transport Committee

**World Forum for Harmonization of Vehicle Regulations**

**175th session**
Geneva, 19-22 June 2018
Item 18.10 of the provisional agenda
**Progress on the development of new UN GTRs and of amendments to established UN GTRs: Hydrogen and Fuel Cell Vehicles (HFCV) (UN GTR No. 13) – Phase 2**

# Terms of reference of the informal working group on the UN GTR No. 13 (Hydrogen and Fuel Cell Vehicles) - Phase 2

**Submitted by the Working Party on Passive Safety***

The text reproduced below was adopted by the Working Party on Passive Safety (GRSP) at the sixty-second session (ECE/TRANS/WP.29/GRSP/62, para. 8). It is based on GRSP-62-25-Rev.1 as reproduced in Annex II to the report. This document, if adopted, shall be appended to the gtr in accordance with the provisions of paras. 6.3.4.2., 6.3.7. and 6.4. of the 1998 Agreement.

* In accordance with the programme of work of the Inland Transport Committee for 2018–2019 (ECE/TRANS/274, para. 123 and ECE/TRANS/2018/21 and Add.1, cluster 3.1), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

GE.18-05576(E)

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# Terms of reference of the informal working group on the UN GTR No. 13 (Hydrogen and Fuel Cell Vehicles) - Phase 2

**Adopted text based on GRSP-62-25-Rev.1 (see para. 8 of this report)**

## A. Introduction

1. In June 2013, the World Forum for Harmonization of Vehicle Regulations (WP.29) and the Executive Committee of the 1998 Agreement (AC.3) established UN Global Technical Regulation (GTR No. 13) for Hydrogen and Fuel Cell Vehicles (HFCV). The UN GTR was developed during Phase 1 by the subgroup safety (SGS) and consists of safety provisions for the hydrogen fuel vessel, fuel system and high voltage system of HFCV. The UN GTR was subsequently adopted and transposed into national regulations by several contracting parties under the 1998 Agreement. Some of the provisions that required long term research were deferred to Phase 2.

2. In March 2017, AC.3 gave general support to a joint proposal submitted by Japan, the Republic of Korea and the European Union to establish an informal working group (IWG) to work on Phase 2 of the UN GTR No. 13 under the framework of the 1998 Agreement.

3. This document sets forth the Terms of Reference (ToR) for the IWG, including objective, scope, operating principles, timeline and deliverables.

## B. Objective of the working group

4. The objective of the IWG is to develop additional safety provisions that were either not ready for adoption in Phase 1 and/or required additional research. The IWG will also update/clarify existing requirements and test procedures in UN GTR No.13 based on new data and on-road experience.

5. The provisions that will attain equivalent levels of safety as those for conventional gasoline powered vehicles will be performance-based and supported by science and data to the extent possible, so as not to restrict future technological development. The scope of work for the IWG in Phase 2 shall include the following items. Should additional items be proposed, the IWG will decide by consensus on their inclusion:

(a) Potential revision of the scope to address additional vehicle classes;

(b) Potential to harmonize vehicle crash test requirements;

(c) Potential to refer the existing high voltage requirements of the UN GTR for electric vehicles;

(d) Requirements for material compatibility and hydrogen embrittlement;

(e) Requirements for the fuelling receptacle;

(f) Evaluation of performance-based test for long-term stress rupture proposed in Phase 1;

(g) Consideration of research results reported after completion of Phase 1 – specifically research related to electrical safety, hydrogen storage systems, and post-crash safety; and

(h) Consideration of 200 per cent Nominal Working Pressure (NWP) or lower as the minimum burst requirement for certain types of fuel containers;

(i) Consider a safe guard system in case of isolation resistance breakdown.

## C. Operating principles

(a) The IWG will be sponsored by Japan, the Republic of Korea and the European Union. The IWG led by Co-Chairs (Japan and the United States of America), vice-chairs (China and Republic of Korea), and a Secretary of the International Organization of Motor Vehicle Manufacturers (OICA);

(b) The IWG is a subgroup of the Working Party on Passive Safety (GRSP) and is open to all participants of GRSP including contracting parties and non-governmental organizations to the 1958 and 1998 agreements;

(c) The IWG will report to GRSP, WP.29 and AC.3;

(d) The official language of the IWG will be English;

(e) All documents must be submitted to the Secretary of the group in a suitable electronic form;

(f) Formatting of documents at least (ten) working days before the meeting. The documents will be posted on the dedicated part of UNECE website at least (five) working days in advance of the meetings;

(g) The Secretary of the IWG will distribute a draft minute of the meetings to all members within (fifteen) working days after any meeting with the view to formal adoption at the next meeting;

(h) Decisions and proposals of the group shall be reached by consensus. When consensus cannot be reached, the Chairs of the group may present the different points of view and seek guidance from GRSP, as appropriate;

(i) Meetings shall be held in agreement with the majority of the participants based on the joint proposal by the Chairs of the IWG. Meetings may be in person or virtual, using web-based technology;

(j) A provisional agenda shall be drawn up by the IWG leadership. The first item of the provisional agenda for each session shall be the adoption of the agenda. The second item shall be the minutes of the previous session followed by technical discussions and miscellaneous items.

## D. Timeline and deliverables

October 2017: First IWG meeting;

November 2017: Report to the World Forum for Harmonization of Vehicle Regulations (WP.29) and the Executive Committee for the 1998 Agreement (AC.3);

December 2017: Report to GRSP;

February 2018: Second IWG meeting;

May 2018: Report to GRSP;

June 2018: Third IWG meeting;

June 2018: Report to the World Forum for Harmonization of Vehicle Regulations (WP.29) and the Executive Committee for the 1998 Agreement (AC.3);

October 2018: Fourth IWG meeting;

November 2018: Report to the World Forum for Harmonization of Vehicle Regulations (WP.29) and the Executive Committee for the 1998 Agreement (AC.3);

December 2018: Report to GRSP;

2019-2020: Three IWG meetings per year with regular reports provided for the WP.29 and GRSP sessions;

End of 2020: Estimated completion of Phase 2 of UN GTR No. 13 (Hydrogen and Fuel Cell Vehicles).

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## Economic Commission for Europe

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**World Forum for Harmonization of Vehicle Regulations**

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Item 4.10.4 of the provisional agenda
**1958 Agreement:**
**Consideration of draft corrigenda to existing UN Regulations submitted by GRs if any**

# Proposal for Corrigendum 1 to Supplement 2 to the 07 series of amendments to UN Regulation No. 16 (Safety-belts)

**Submitted by the Working Party on Passive Safety***

The text reproduced below was adopted by the Working Party on Passive Safety (GRSP) at its sixty-second session (ECE/TRANS/WP.29/GRSP/62, para. 14). It is based on GRSP-62-08 as reproduced in Annex IV to the report. It is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Administrative Committee AC.1 for consideration at their June 2018 sessions.

* In accordance with the programme of work of the Inland Transport Committee for 2018–2019 (ECE/TRANS/274, para. 123 and ECE/TRANS/2018/21/Add.1, cluster 3.1), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

GE.18-05530(E)

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# Corrigendum 1 to Supplement 2 to the 07 series of amendments to UN Regulation No. 16 (Safety-belts)

*Paragraph 8.3.6.*, amend to read:

"8.3.6. ...

The pitch angle used for the geometrical assessment above shall be as measured in paragraph 5.2.3.4. of UN Regulation No. 14 or 5.2.2.4 of UN Regulation No. [144].

..."

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**World Forum for Harmonization of Vehicle Regulations**

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Item 4.6.8 of the provisional agenda
**1958 Agreement:**
**Consideration of draft amendments to existing UN Regulations submitted by GRSP**

# Proposal for Supplement 1 to the 01 series of amendments to UN Regulation No. 137 (Frontal impact with focus on restraint systems)

## Submitted by the Working Party on Passive Safety*

The text reproduced below was adopted by the Working Party on Passive Safety (GRSP) at its sixty-second session (ECE/TRANS/WP.29/GRSP/62, para. 38). It is based on GRSP-62-05 as reproduced in Annex VIII to the report. It is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Administrative Committee AC.1 for consideration at their June 2018 sessions.

* In accordance with the programme of work of the Inland Transport Committee for 2018–2019 (ECE/TRANS/274, para. 123 and ECE/TRANS/2018/21/Add.1, cluster 3.1), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

GE.18-05531(E)

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## Supplement 1 to the 01 series of amendments to UN Regulation No. 137 (Frontal impact with focus on restraint systems)

*Annex 3*

*Paragraph 5.2.4.1.*, amend to read:

"5.2.4.1. The axial compressive force is measured with a CFC of 600."